

THE PROTOCONCHS OF CERTAIN PORT JACKSON
GASTEROPODA.

BY H. LEIGHTON KESTEVEN.

(Plates xxxv.-xxxvi.)

In the "Catalogue of Tertiary Mollusca in the British Museum" (Introduction, p. xiv.) Harris says:—"I have found that the greatest difficulty in defining the brephic [or nepionic] stage is in those cases where a strong varix has been thrown up at the conclusion of the embryonic stage, and it seems right that this should be so. For the varix *certainly indicates a pause in the growth of the shell, and it is reasonable to suppose that during that pause the animal was passing through the brephic stage*, but did not continue to make the normal shell of that period, except partially, it may be, in some instances. I have even doubted whether in certain instances *the varix alluded to was not, in fact, the only manifestation of the growth of the shell during the brephic [or nepionic] stage.*" The italics in both instances are mine.

In some of the shells discussed here, especially *Murex australis*, the sculpture of the shell which follows the "varix thrown up at the conclusion of the embryonic stage" is, in miniature, that of the adult. The original of fig. 11, pl. xxxv., is on that account identifiable without obtaining a series.

The auxological terms of Professor A. Hyatt apply to morphological not conchological periods of growth. That being so, it seems to the writer that the nepionic stage of the marine Gasteropoda may be defined thus:—that stage in which the embryo, having reached its full development, loses its embryonic characters and assumes its adult form. If this be right, that there should be a pause in the growth of the shell is only natural, and I would

suggest that it may be that where no varix has been thrown up the mollusc has left no conchological record of the nepionic period.

The arguments which might be advanced in support of this suggestion are of necessity only deductive and analogous, and therefore not conclusive; but they are sufficiently so to defend my use of Hyatt's term ananeanic (Hyatt, Zool. Anz. No. 427, 1893, p. 327) for early adult structure instead of the term brephic (= nepionic) used by Harris (*loc. cit.*).

It will be noticed that the descriptions are of "Protoconchs" and "Apices." The distinction is perhaps arbitrary, but nevertheless useful. The former term is applied to a detached embryo, the latter to one which is attached to some adult structure.*

Before proceeding to describe the apices, it may be deemed fitting to give an account of my mode of identifying them. Whilst sorting sand, shells are met with which are at once recognisable as young; these are the material on which I start to work. In some instances specimens consisting of a protoconch and only one adult whorl are identifiable, but in most cases a series illustrating the growth up to the paraneanic and even the ephelic stages, is needed before the young can be identified with certainty. *Murex australis*, Quoy & Gaim., is illustrative of the former instance, whilst *Tritonium fusiforme*, Kiener, is illustrative of the latter. I had to obtain an almost complete set of specimens, that is, a series illustrating almost every stage in the growth of the shell, before I could determine its young satisfactorily. I have found it more practical to obtain the young shells first and refer them to adults, than to take an adult shell and determine to find its young. I would warn students from identifying young shells hastily; some of them are very deceptive; for example, the sculpture and general appearance of *T. fusiforme* up to the end of the paraneanic stage are so suggestive of *T. exaratus*, Reeve, that I at once put it down as the young of that species, and it was only when I had obtained a large series of

* For the purposes of this paper I have found it convenient to speak of all post-embryonic structure as adult structure.

the latter that I discovered my mistake. Such an instance as this calls for a most careful examination of every species dealt with.

The protoconchs treated of in this paper have occurred to me in sand from various bays in and around Port Jackson, and have been identified in the manner described above.

MUREX AUSTRALIS, Quoy & Gaim.

(Plate xxxv., figs. 10-11.)

Protoconch balloon-shaped, imperforate, solid, brick-red fading to yellow at the tip, consisting of about one and one-half whorls, defined by a rounded varix; devoid of an epidermis; sculptured with slightly waved transverse ribs, as broad as their interstices, and with very fine punctured revolving groove liræ, the transverse sculpture becoming fainter towards the tip, leaving the first half whorl ornamented only by the revolving liræ, the absolute nucleus being almost smooth. Mouth almost round, but the short, broad canal gives it a pear-shaped appearance. Outer lip thick, well rounded. (The specimen figured shows the commencement of the adult structure from inside the variced lip). Inner lip thin, well defined. Pillar twisted. Anterior canal short, rather wide and shallow; there is no sign of a posterior canal. Dimensions of protoconch, length 2, breadth 1.5 mm.

MUREX ANGASI, Crosse.

(Plate xxxvi, figs. 6-7.)

Apex thin, semi-pellucid, of about three-quarters of a whorl, defined by a varix, devoid of an epidermis, its surface polished, showing only very fine growth-lines. The whorl is obtusely angulated high up, the varix is prominent up to this angle, where it ceases, the transition from embryo to adult being marked on the top of the whorl by a slight groove only, the tip of the nucleus depressed.

I have not obtained the protoconch detached. Fig. 6 represents the youngest example I have. The dimensions of this specimen are, length 2.3, breadth 1.3 mm.

TRITONIUM FUSIFORME, Kiener.

(Plate xxxv., figs. 3-5.)

Protoconch ovoid, umbilicate, thin, semi-pellucid, shining, corneous, light brown, variously marked with spots or stripes of darker colour, consisting of about three whorls, covered with a very thin light brown epidermis. Transversely sculptured with very fine growth-lines; the epidermis supplies four ciliated ridges which encircle the last whorl, the top one of which is continued on the earlier whorls. Mouth nearly ovoid; outer lip thin, well rounded, and very slightly reflected; inner lip undefined; pillar short, slightly bent. Anterior canal merely indicated by a broad shallow sinus. Umbilicus small, and owing to the transparency of the shell only seen in certain lights. The transition from embryo to adult is marked by a very slight reflection of the outer lip of the embryo and the complete change of the shell-structure. Dimensions of protoconch, length 2, breadth 1·9 mm.

TRITONIUM OLEARIUM, Linn.

(Plate xxxv., figs. 4-5.)

Protoconch thin, attenuately conical, imperforate, semi-pellucid, shining, corneous, light brown, consisting of six whorls, under the microscope very finely transversely and longitudinally lirulate, covered with a very thin, light brown epidermis. Mouth somewhat ovate; outer lip thin, rounded; inner lip distinct; pillar slightly bent back anteriorly. Anterior canal distinct under the pillar but undefined on the outer lip. The junction of the embryonic with the adult structure is marked by a slight varix and a complete change of structure. A few coarser transverse lines may be noticed on the body whorl of the embryo just before its junction with the adult. Dimensions of protoconch, length 4·3, breadth 2·5 mm.

The general appearance of this protoconch is that of an *Alaba*, and but for the anterior canal might be mistaken for one. It looks peculiarly out of place standing up from the rather flat crown of the early adult whorls.

If the whole of the embryonic life is spent as a pelagic existence, the wide distribution of this species is easily explicable.

TRITONIUM SPENGLERI, Chem.

(Plate xxxvi., figs. 8-9.)

Apex thin, semi-pellucid, corneous, shining, consisting of four and one-half whorls, covered with a thin brown epidermis, very finely transversely and longitudinally lirulate. Junction of embryo and adult marked by a broad flat varix and a complete change of structure. Dimensions of protoconch (approximately), length 3, breadth 2 mm.

The peculiar oblique way in which the apex is set on the adult whorls is unique. The above dimensions are taken from the specimen figured.

TRITONIUM SPECIOSUM, Angas.

(Plate xxxvi., figs. 10-11.)

Apex solid, slightly polished, dull yellowish-brown, consisting of a little more than one whorl, sculptured with fine revolving hair-lines, which are broken up into irregular lengths. The junction between embryonic and adult structure is marked by a small varix and a complete change of structure. Dimensions of specimen figured, length 3·5, breadth 1·5 mm.

GYRINEUM AUSTRALASIA, Perry.

(Plate xxxvi., fig. 1.)

Ranella leucostoma, Lam. (*vide* Mr. Hedley's Note on this synonymy, *ante*, p. 631).

Apex solid, polished; colour variable, of different shades of brown; consisting of about five whorls, perfectly smooth and devoid of an epidermis. The junction between embryo and adult is marked by the sudden acquisition of a complex sculpture. Dimensions of protoconch (approximately), length 5·3, breadth 4 mm.

Although this apex has a thoroughly strong appearance, it is generally dropped early in the life of the adult mollusc, half

grown specimens with their apices on being rare. It has occurred to me that this apex, like that of *Scaphella*, may have been deposited inside an original corneous one which was discarded in, or soon after the mollusc left, the egg-capsule.* The above measurements of the protoconch are taken from the specimen figured.

SISTRUM NEGLECTUM, Angas.

(Plate xxxvi., fig. 2.)

Apex thin, semi-pellucid, polished, devoid of sculpture and epidermis, of about one and one-half whorls. The protoconch is not sharply defined, but the acquisition of a slight sculpture suggests the termination of the embryonic structure. Dimensions of the specimen figured, length 3, breadth 1.5 mm.

CAPULUS VIOLACEUS, Angas.

(Plate xxxv., figs. 7-9.)

Apex of a little more than one whorl, devoid of an epidermis, thin, brown, smooth, shining. The specimen figured shows a division between the embryonic whorl and the succeeding adult whorl; this is not always present. I have seen specimens which show no such division. Fig. 9, pl. xxxv., represents the ananeanic sculpture from a specimen slightly older than the one figured. The embryonic structure is defined by the acquisition of sculpture. Greatest diameter of the protoconch 1 mm.

LIOTIA CLATHRATA, Reeve.

(Plate xxxv., fig. 6.)

Apex of one whorl, slightly depressed, thin, smooth, white, semi-pellucid, shining, defined by the acquisition of sculpture. Greatest diameter of protoconch 1.5 mm.

The neanic structure of this species is perhaps more interesting than the protoconch. So unlike the full grown shell is it

* See Dall, Bull. Mus. Comp. Zool. Harvard Coll., Vol. xviii., 1889, p. 452.

that for a long time I was at a loss to know what the specimens were. The revolving riblets which so mark the adult shell are entirely absent, and the whorls, instead of being most prominently angulated at the lower periphery, are only angulated superiorly; but the character which most disguises the young shell is its stellate form. The fine transverse hair-lines which may be seen between the transverse and longitudinal riblets of a fully grown shell are closely and uninterruptedly packed all over the upper surface of a young specimen. But for the deep sutural groove, the figure represents a similar stage in the growth of *Liotia subquadrata*, T. Woods.

TURBO STAMINEUS, Martyn.

(Plate xxxv., figs. 1-3.)

Apex of one and one-half whorls, depressed, thin, semi-pellucid, white, smooth, defined by a thickening of the shell and a loss of the porcellanous appearance. Light reflected up the perspective umbilicus may be seen shining through the apex. Greatest diameter of the protoconch 1.5 mm.

The shell at the stage figured is generally bleached a dull white, but I have a specimen in which the ananeanic structure is variegated with bright crimson and green, and ornamented round the suture with light blue blotches. The specimen figured shows the commencement of the broad sutural gutter.

EXPLANATION OF PLATES XXXV.-XXXVI.

PLATE XXXV.

- Figs. 1-3.—*Turbo stamineus*, Martyn; young.
 Fig. 4.—*Tritonium olearium*, Linn.; protoconch attached.
 Fig. 5.— “ “ “ ; protoconch.
 Fig. 6.—*Liotia clathrata*, Reeve; young.
 Figs. 7-8.—*Capulus violaceus*, Angas; young.
 Fig. 9.— “ “ “ ; sculpture of same.
 Fig. 10.—*Murex australis*, Quoy & Gaimard; protoconch.
 Fig. 11.— “ “ “ “ ; protoconch attached.

PLATE XXXVI.

- Fig. 1.—*Gyrineum australasia*, Perry; protoconch attached.
 Fig. 2.—*Sistrum neglectum*, Angas; showing the apex.
 Fig. 3.—*Tritonium fusiforme*, Kiener; protoconch attached.
 Fig. 4.— " " " ; first adult whorl.
 Fig. 5.— " " " ; protoconch.
 Fig. 6.—*Murex angasi*, Crosse; protoconch attached.
 Fig. 7.— " " " ; a somewhat older specimen showing the protoconch from the other side.
 Fig. 8.—*Tritonium spengleri*, Chemnitz; protoconch attached.
 Fig. 9.— " " " ; an older specimen illustrating the oblique position of the protoconch.
 Fig. 10.—*Tritonium speciosum*, Angas; protoconch attached.
 Fig. 11.— " " " ; sculpture of the protoconch.